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ABSTRACT

The difficulties children have when learning to read vary from child to child and from age to age. Some learning variables transfer as a child develops so that skills acquired in early learning stages transfer to more mature stages of development. However, the abilities that transfer and produce effects at one stage of learning may be different from those that transfer at later stages of learning. Among poor readers, at least two factors may differentiate among individuals: slow maturation of the brain and impaired cerebral function due to damage. Other complexities may also be involved in a child having difficulty learning to read so that it is inaccurate to suppose that poor readers form a homogeneous group. (TJ)

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ON THE DIFFERENTIAL TRANSFER OF ABILITIES TO READING

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The purpose of this paper is to consider the question of which individual difference variables have transfer value at various stages of learning reading skills ranging from those characterizing acquisition at early stages of learning to read to later more facile and mature stages of reading development. In general we take the position that different abilities or skills serve to differentiate normal readers from their poorer reading peers at various reading levels. Put in another way, abilities which discriminate normal from poor readers who are reading at a first grade level are not the same as those which would serve the same function for say readers at the third grade level. In turn discriminating variables at the third grade level are likely to be different than those found at the sixth or seventh grade level. (cf. Ohnmacht, 1970).

First, consider some early work which has done much to shape our thinking in these matters. In two seminal papers, Ferguson (1954, 1956) proposed a broad schema drawing together, within a single conceptual framework, the study of human learning and the study of human ability. Abilities are considered to be the result of overlearning of patterns of processing information as evidenced by behavior which, when overlearned, become more or less invariant and at least a crude limit of performance is reached. The second important aspect of Ferguson's theory concerns the role of abilities, as thus defined, in subsequent learning. Here, the question of the transfer of abilities to subsequent learning is at issue and more importantly, for our purposes, it is suggested that the abilities which transfer and produce their effects at one stage of learning may be different from those which transfer at later stages of learning. Indeed, Fleishman (1967) has repeatedly demonstrated this to be the case when the acquisition of various psychomotor

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skills is studied. He has found that the abilities relevant to acquisition of skill early in a learning skill are not the same abilities which transfer at terminal stages of learning.

A model of learning and transfer based on a conception of hierarchical learning sets has been presented by Gagne (1962). For Gagne, a complex learning outcome is dependent on subordinate capabilities referred to as learning sets with any set possibly itself having several subordinate learning sets itself, thus the hierarchical nature of the model. Subordinate learning sets are viewed as mediating positive transfer to learning sets above them in a postulated network and is termed vertical transfer. Lateral transfer has to do with the broadening application of a learning set in a variety of situations. Importantly, the learning sets at the bottom of a hierarchy are fundamental human capabilities which are immediately relevant to various contiguous learning sets. These fundamental capabilities are in part a function of prior learning, and in part a function of development (i.e., maturation of visual receptors and the like). Learning sets higher in a hierarchy are those sets implicated as being particularly relevant to the task to be learned as a function of a sequence of instruction. Of course, there are points of contact here with Ferguson's theory. Early in life fundamental abilities due to maturation unfold and make a contribution to the attainment of other abilities through the interaction of the individual with his environment. Abilities are those human capacities which have reached their crude limit of performance or learning. If one seeks to instruct someone, subsequent learning sets (for example, how to read) must be imparted and the basic abilities mediate transfer to these sets. To make progress, subordinate sets must be mastered before superordinate sets may be accomplished. In one sense then each subordinate set must be overlearned to become, in Ferguson's terms, an ability, which in conjunction with more basic abilities mediate transfer to higher levels. Failure to acquire subordinate set mastery or more fundamentally to reach sufficiently high

levels of performance on the most fundamental abilities might result in a cumulative deficit for the learner as superordinate learning sets are encountered in an instructional sequence due to an inadequate basis for mediating transfer to higher levels.

With the foregoing as a basis for organization let us consider several examples from the literature which suggest that the differential transfer of abilities to reading at various stages of reading development is a reasonably satisfactory model. Consider visual perceptual variables. At an early stage (say before age 5), such variables are in a state of flux and changing rapidly as a function of maturation and learning. Over time these variables begin to assume the role of abilities ala Ferguson, since most children reach stable levels of performance. Of course, the age at which such stability is attained may very well vary from child to child and from ability to ability. But beyond this, it is interesting to note that visual perception variables are more strongly related to gross terminal reading performance at the end of grade one and there is a decrement when the criterion is performance at the end of subsequent grades. (cf. Goins, 1958; Rosen and Ohnmacht, 1967). This very general observation can be viewed as a function of differential transfer.

Of course, the reason for such a state of affairs is open to differential interpretation. Rourke (1975) has summarized a number of studies which at this point may be viewed at least in part as supporting his (and others) contention that cerebral dysfunction due to brain damage plays a role in reading retardation while at the same time providing support for hypotheses relating to changing nature of deficits responsible for reading retardation with advancing age which spring from a developmental lag position. (cf. Satz, et al. 1976, 1971). The types of studies summarized by Rourke (1975) and Satz et al. (1976) suggest that within a typical group of disabled readers at least two sub-groups can be identified. One sub-group's deficits are attributable to impaired left or right cerebral

dysfunction due to damage, whereas the other group's dysfunction is due to a lag in the maturation of the brain which delays the acquisition of skills important to early phases of reading (i.e., differentiating graphic symbols and the like). This is quite consistent with the observation of De Hirsch, Jansky, and Lansford (1966) that about half of an observed group of poor first grader readers subsequently made improvement while the rest continued to fail.

Interestingly Brittain (1970) found that the ability to apply morphological rules demonstrated an increasing relationship with reading achievement over grades 1 and 2 which is consistent with the notion that as children mature, variables which differentiate normal from poor readers begin to reflect linguistic processes. Some of our own work (Ohnmacht and Fleming, 1975) suggests that by second grade normal readers tend to encode words on the basis of their semantic features whereas their poorer reading peers are dominated by the phonemic features of a word. By sixth grade these differences are notable by their absence. As another case in point children's ability to utilize superordinate taxonomic categories to organize retrieval of word lists from memory makes an increasing contribution to the prediction of reading achievement during the early years of schooling (Ohnmacht and Corrado, in preparation). Indeed, at a more reductionistic level, Kinsbourne (1976) reports differential transfer of presumed specific reading component tasks to reading performance over relatively short periods of time during initial instruction in reading (6 to 9 months).

A recent study by one of our students (Warren, 1977) points to additional complexities. He studied the rate of development of the ability to bound words employing six word boundary recognition tasks; three each in the modalities of speech and print. Further he evaluated the validity of each task to predict reading achievement at the end of kindergarten, 1st grade and 2nd grade. He found rate of development and their trends varied among the tasks over the age range studied and that any grade level the tasks exhibited a degree of

independence which suggested that the ability to bound words is not a unitary ability at the grade levels studied. He also noted the word boundary tasks continued to make non-trivial contributions to the prediction of end of year reading achievement, but that the task or tasks contributing to the prediction changed from grade to grade! Thus, even when considering a particular ability such as word bounding it is quite possible to identify variants in task requirements which identify facets of the ability which develop differentially and themselves demonstrate empirical patterns consistent with a differential transfer model.

In sum, given the strong case which can be made for differential transfer of abilities to reading, it follows that no one phenomenon--no one etiological explanation--can account clearly and persuasively, at even only one stage of development, for children's difficulties in learning to read. These days one might assume this to be truism, and yet Vernon (1977:396) currently claims that, in her words, an "incorrect assumption still [is] held by many . . . that the cause of reading difficulties is unitary; that is, that all reading problems arise from a single inherent deficiency that is the same in all poor readers." In her concise manner of treating the topic of varieties of deficiency in the reading processes she reminds us that, once again in her words, " . . . it should be evident that little will be gained if disabled readers are regarded as a homogeneous group (Vernon, 1977:407)." We take her words to be a compatible echo of our position which also suggests that while none are sufficiently explanatory, equally so no one phenomenon or etiological explanation should be ruled out--out of hand--as a potential source of children's difficulties in learning to read.

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